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The Nature of IT Firms: A Systemic Literature Review and Analysis

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The Nature of IT Firms: A Systemic Literature Review and Analysis

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ABSTRACT

IT firms have grown in economic importance in the last few decades. It is the interest of both practitioners and researchers across a range of business management and information system disciplines. Having conducted a systemic literature review, we proposed a new conceptual definition and conceptual frameworks which together provides a deeper understanding of the essence of "IT firms". The definition we proposed of IT firm offers a way forward for identification of IT firms with increased understanding and a clear boundary. The conceptual framework synthesized the characteristic dimensions of IT firms. It not only improves current understanding of IT firms but also provides a solid foundation for further studies of IT firms. The types of IT firms developed in this paper offers a means of classifying different IT firms. The IT firm development framework in relation to innovation focus and improvisational capabilities not only advances understanding about IT firms, but also provides further research opportunities towards empirical testing and knowledge building. The insights discovered in the paper are also useful for business practitioners in strategy and consulting. The frameworks provide useful knowledge and advice for IT firms within the industry.

Keywords: IT firm innovation, types of IT firms, IT firm definition, conceptualisation of IT firm, improvisational capabilities

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INTRODUCTION

In the recent decades, information technology (IT) firms have taken center stage in our modern economies. IT firms have become the driver of economic growth, created innovative products and changed the way we live our lives (Paul and Gupta, 2014). IT firms also have a direct and/or indirect influence on other firms due to their nature and integration into other industries' environments (Breznik & Lahovnik, 2012). The importance of IT firms is evident in the wide coverage they receive in the mass media as well as academic and business publications. However, despite the importance of IT firms in our economy, we still lack a deep and up-to-date understanding of what an IT firm is in our fast-changing world.

The aim of this paper is to examine the nature of IT firms and provide a deeper understanding that capture the essence of IT firms. There are a number of grounds for believing that this systemic literature review is both necessary and timely. Currently, there is no widely accepted comprehensive definition of what an IT firm is both in literature and in practice. The very few definitions appeared in the literature are based on vague undefined constructs or on a single perspective that actually include some non IT firms and left out other IT firms (Lee *et al.*, 2015; Pollach, 2011). There is also a lack of agreement in the literature about specific criteria to be used in deciding which firms should be categorized as an IT firm. In addition, there is inadequacy in cohesive understanding about the nature of IT firms. Due to the digital disruption in the recent years, the nature of IT firms has evolved as well. The previous identification of IT firms using industry product classification is no longer adequate to capture the full essence and different types of IT firms. For example, Uber would be classified under the taxi industry, but very few would disagree that Uber is also an IT firm. (Canace, 2014; Findikoglu & Watson-Manheim, 2015).

The lack of a deeper understanding of IT firms hinders research advancements (Locke & Golden-Biddle, 1997). Confusion about the nature of IT firms and lack of an up-to-date, commonly accepted definition interferes with the appearance of a common research language, thus making it difficult for researchers to build upon the work of others (Grinstein & Goldman, 2006). Also, better understanding of the different types of IT firms and factors influencing them would allow researchers to better scope their studies. In addition, the lack of a clear concept and deeper understanding hinders government efforts to support IT firms, and impede the attempt of consulting and investment firms to properly benchmark and assess the risks of different types of IT firms.

Given the importance of IT firms and the problems with lack of deeper understanding, this paper is motivated by the need for a comprehensive and integrated definition of IT firms, and a conceptual framework that captures the essence of IT firms. Our research question is "What is the nature of IT firms?". The remainder of this paper is structured as follows: Section 2 describes the methodology employed. Section 3 presents the synthesized conceptual frameworks showing and discussing the key characteristics of IT firms and the insights about different types of IT firms, as well as presenting the new definition of IT firms. Section 4 concludes the paper and discusses the contributions and limitations.

METHODOLOGY

In order to identify the recurring attributes and reveal the underlying characteristics of IT firms, we conducted a systemic literature review and analysis. The main aim of the systemic literature review is to define "IT firm" and to propose a conceptual framework to provide insights about the nature of IT firms. We followed a three phase process of systemic

literature review approach, which is widely used in the IS field (Cumbie *et al*., 2005; Palvia *et al*., 2015). Phase 1 involves the accumulation of a representative pool of IT firm articles. Phase 2 involves the classification of articles, and Phase 3 involves a thorough review and synthesis of the data into an appropriate framework. In the following, we will introduce the detailed approach on each stage of the process.

Phase 1 Article Selection

We conducted literature search from business and information technology databases. The databases used include Web of Science, Scopus, Business Source Complete and Emerald Insight. We used key words such as "IT firm", “IT company”, "information technology firm”, "information technology company”, “high tech firm”, “high tech company”, “IT startup” and “Information Technology startup” individually. Initially, 1248 articles were retrieved from the database searches. We then compared the retrieved articles from different databases and removed the duplication. Around 600 articles were left after the duplicates were removed. After that, we analyzed the article titles, abstracts, and introductions of the remaining papers to determine whether it should be included in our data analysis. Our inclusion criteria constitute all articles where the studies are about or closely related to IT firms. We also included articles that used IT firms as their sample even though the actual study is not about IT firms.

After satisfying the inclusion criteria, we then applied the exclusion criteria to the remaining papers, to remove papers that only mentioned IT firms in less than a couple of sentences without any further explanation as these papers are of little analytical value. In addition, we have removed papers that we do not have full text English access. Less than 200 papers were left at this stage, to which we then removed articles that focused on information technology but not at firm level, such as IT technology itself or IT personnel at individual levels. Only articles regarding IT at firm levels are the focus of our research. To ensure reliability, we have employed an independent person to follow the same selection process which resulted 2% differences. The differences were then reconciled by discussion. Finally, 119 journal articles were selected from various research fields to be relevant for our study.

Phase 2 Classification

The articles have been initially classified into 2 categories due the nature of the articles. For the first category of articles, the topics of research are about IT firms or closely related to IT firms. While the IT firms are not the focus of the study for the second category of articles, these studies have used IT firms as their sample for the research. Furthermore, we extracted and analyzed all existing definitions of IT firms that appeared in the literature.

Phase 3 Review and Synthesis

In order to develop a comprehensive and integrated definition of IT firms and reveal the underlying characteristics of IT firms, we used content analysis of relevant literature. Content analysis allows the researchers to includes large amounts of textural data and then systematically mines, make inferences and identifies common shared properties regarding the phenomenon of interests (Holsti, 1969; Krippendorff, 2004; Al-Debei & Avison, 2010). The use of content analysis is appropriate in this research given that the data source is the existing body of literature on IT firms. In this study, we used a qualitative approach to content analysis (Altheide, 1996; , Bryman, 2015) by allowing themes to emerge by reviewing the text. We examined the written text carefully to seek themes that emerged from the literature. From this analytical course of action, we identified five common characteristics of IT firms as well as three distinct type of IT firms. To infer a general definition of IT firms, we used the collected information as guidelines to synthesize the knowledge of IT firms into a comprehensive and integrated definition. This approach we have followed is commonly used for systemic literature reviews (Al-Debei & Avison, 2010; Baregheh *et al*., 2009).

SYNTHESIZED FRAMEWORK OF IT FIRMS

In this section we present the synthesized conceptual framework showing and discussing in detail the key dimensions of IT firms as well as suggesting the new definition of an IT firm. In addition, we provide insights about different types of IT firms and the IT Firm Development Framework.

Common Characteristics of IT firms

The use of content analysis of the relevant literature facilitates the construction of a conceptual framework that classified the common characteristics of IT firms into external and internal dimensions with five sub clusters briefly described in the figure below (See Figure 1). Competitiveness and a turbulent business environment are the key characteristics that distinguishes IT firms from other traditional firms in terms of external business operating environment. The internal dimension of IT firm’s characteristics is concerned with the innovation, intellectual property and knowledge intensive IT human capital. The details are discussed below.

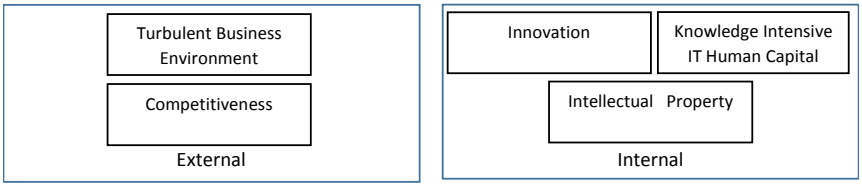

Figure 1: Common Characteristics of IT Firms

Turbulent Business Environment

A distinctive characteristic of IT firms revealed from the literature analysis is the turbulent business operating environment. IT firms operate in much more turbulent business environments compared to other traditional firms. IT firms belong to the knowledge-based economy in which unpredictable and rapidly changing environment is the norm, and knowledge, creativity, and innovation play an ever-increasing role in generating and sustaining growth (Ramayah, 2010; Cisco & LIW, 2015).

"One of the most predictable things about today's business world is its unpredictability. ... To achieve that position in such a competitive and rapidly changing market such as technology is perhaps even more remarkable . . ." C1-25 (Cisco & LIW, 2015).

This is quite different to firms that operate in a traditional business environment. The traditional businesses operate in much more predictable environments in which the focus is on prediction and optimization-based efficiencies (Singh, 2010). Information systems are used in the traditional businesses for achieving the strategic alignment with organizational goals using pre-defined 'best practices'. The assumption is that these 'best practices' retain their effectiveness over time due to the more stable environment and certainty regarding future markets (Singh, 2010; Chen, 2010; Tak & Lim, 2008).

In contrast to the traditional firms, the increasing turbulent operation environment of IT firms is characterized by high levels of uncertainty and an inability to predict the future (Almeida, 2008). The use of best practices in the information and control systems with pre-defined goals may not necessarily achieve long-term organizational success (Singh, 2010). The increasing turbulent environment of IT firms challenges the assumptions underlying the 'accepted way of doing things'. IT firms need the capability to understand the problems afresh given the changing environmental conditions. The focus is not only on finding the right answers but on finding the right questions. This turbulent environment is contrasted from the traditional stable environment by its emphasis on 'doing the right thing' rather than 'doing things right' (Singh, 2010; Andriole, 2010; Huang, 2009).

"Couple this with a marketplace that continues to evolve rapidly as technology changes and advances, an ever-expanding menu of IT offerings, options and services, and increased customer demand for superior quality products and services in shorter time frames, and it becomes clear that matters are not getting any easier for the small IT provider." C2-31 (Swinarski *et al*., 2012)

"IT are characterized by technical and market-based uncertainty. Technical uncertainty arises due to concerns about the feasibility of the new technology, and market uncertainty arises from the lack of knowledge about whether customers will ultimately prefer the product . . ." C1-05 (Banker *et al*., 2011)

A few existing literatures investigated the persistence and change in the industry leading IT firms as well as how and why certain IT firms thrive in the dynamic environments of rapid technological change while other firms do not (Gemser *et al*., 2006; Chen, 2010; Cisco & LIW, 2015; Swinarski *et al*., 2012; Almeida, 2008). To keep pace with the pathway to success in the rapidly-changing and competitive environment, IT firms must build or acquire new capabilities and then leverage these to ensure long-term survival (Almeida, 2008).

Competitiveness

Competitiveness is another characteristic that comes to light from our literature review. IT firms are facing higher competition compared to other firms. There are major international players as well as local players. Globalization has accelerated competition among IT firms, which has caused them to compete not only with local rivals but also with global competitors (Kang *et al*., 2014).

"No longer shielded from the global marketplace, small IT providers must contend with competition from overseas companies. Further, this competition is not limited to contract programming. Global players are now involved in higher IT functions and consulting opportunities, including system design, systems integration, and contract management." C2-31 (Swinarski *et al*., 2012)

The fast pace of technological change can lead to the development of new products that pose a threat to existing products (Banker *et al*., 2011). How to respond appropriately to the potential threat posed by new entrants is a common dilemma facing incumbent IT firms. While this threat exists for all incumbent firms, it is more pronounced in the IT firms due to faster technological change, shorter product life cycles, low cost of entry, as well as both technical and market uncertainty surrounding new innovation (Banker *et al*., 2011; Sang-Yong Tom, 2006; Ackroyd, 1995; Huang, 2009).

"While existing capabilities provide the basis for a firm's current competitive position, without renewal, these same capabilities will soon become rigidities that will constrain a firm's future ability to compete. Therefore, firms need to revitalize their operations by changing the scope of their business, their competitive approaches, or both." C1-384 (Huang, 2009)

"IT industries portray characteristics of intense rivalries, constantly evolving strategies, instant imitators and few barriers to entry . . ." C2-02 (Almeida, 2008)

The low cost of entry in IT industries makes it easier for start-ups with intellectual capital to emerge as industry leaders in a short time (Banker *et al*., 2011; Zhu & Qian, 2015). The rapid technological changes coupled with low start-up costs facilitate the flourish of start-up IT firms that try to build business models around new technologies. All IT firms needs to be constantly aware of the emerging technology landscape as well as the shifting consumer preferences to stay competitive (Banker *et al*., 2011; Globerman *et al*., 2005; Canace, 2014; Zhu & Qian, 2015). With the increasing competitive landscape, no firms are safe. The leading IT firms of the yesterdays can quickly get overtaken by the star firms of today. The leading IT firms of today can quickly get overtaken by the rising stars of tomorrow (Kang *et al*., 2014; Findikoglu & Watson - Manheim, 2015; Ovidiu-Iliuta, 2014).

"Firms today need to be fast growing, efficient, flexible, adaptable and future-ready to secure and maintain a dominant market position. Without these qualities, it is virtually impossible to be competitive . . ." C1-13 (Canace, 2014)

"Rapidly changing technological trends intensified the competition among technology firms, and the ability to fulfill complex and innovative technology requirements of the customers became increasingly important . . ." C1-29 (Findikoglu & Watson - Manheim, 2015)

Innovation

It is evident from our literature pool that innovation has been increasingly seen as the most critical competitive advantage of IT firms (Wang *et al*., 2012). In the IT industry, there is a clear difference in relation to firm performance between firms that innovate and those that do not. Developing a sound innovation strategy is an important part of strategic management in any firm, but especially for IT firms, since IT product life cycles are shorter and the industry competitive environment is more dynamic compared to the more stable traditional industries (Ramayah, 2010, Chen, 2004). Knowledge-intensive businesses such as IT firms are seen as the enablers of innovation, and the innovative efforts in these firms are different than those in traditional firms due to the knowledge-intensive nature of these firms (Jha & Bose, 2015).

"There is a clear difference in terms of organizational performance between firms that innovate and those that do not. The advantages of product innovation are numerous and have been well acknowledged empirically by numerous studies . . ." C1-62 (Ramayah, 2010)

Porter (1996) defines innovation as an attempt to create competitive advantage by perceiving or discovering new and better ways of competing in an industry and bringing them to the market. Innovation leads to the creation of new markets, as well as new and improved products in order to achieve growth, better performance and sustainable competitive positions (Ramayah, 2010).

Innovation process has been tackled by some studies within the IT firm literature. Both Research and Development (R&D) and acquisition strategies are commonly pursued by firms in the IT industry (Banker *et al*., 2011). Empirical studies have found that more diversified IT firms are more likely to innovate through acquisitions than from R&D (Banker *et al*., 2011). Nonetheless, the importance of an IT firm's R&D has also been well documented. R&D helps IT firms to develop the absorptive capacity to generate new knowledge and in turn identifies the potential opportunities to fill the gaps in the industry positioning map, such as new customer segments, new customer needs, or new production methods (Hwang *et al*., 2013; Chen, 2004). In addition, the nature of innovation in IT firms are systemically shifting from hardware to software. (Arora *et al*., 2013). Given the importance of innovation to IT firms, more research is needed to develop deeper understanding of IT firm's innovation process.

Intellectual Property

Intellectual property is a crucial strategic asset in the rapid technological development of IT firms. The world of intellectual property organization defines intellectual property as the creations of the mind; inventions; literary and artistic works; and symbols, names and images used in commerce. Patent, trade mark, copyright and design rights are all part of intellectual property (Halpern and Johnson, 2014). For IT firms, patent is the most important type of intellectual property. Patents owned by a firm represent the output of its research efforts and the codified knowledge that it has created during the inventive process. Strategic patenting is particularly important in cumulative technologies like semiconductors, software, and business methods (Dibiaggio *et al*., 2014).

"Most new software and Internet services companies pay little or no dividends, do not place much emphasis on profits, and invest mainly in intellectual capital rather than physical assets . . ." C1-23 (Cusumano, 2012)

"Patent data are commonly used to elucidate inventive capabilities, especially in the semiconductor industry … Although certain firms do not protect their inventions through patents, in the semiconductor industry, patenting is a vital part of maintaining technological competitiveness. Semiconductor firms sell products embedded with hundreds, if not thousands, of patented inventions. . ." C1-24 (Dibiaggio *et al*., 2014)

A number of researchers used patent statistics to analyze IT firms' technological competencies and to analyze their knowledge base characteristics (Dibiaggio *et al*., 2014; Cho, 2009b; Silvola, 2006; Lee *et al*., 2015). Studies that examined the differential

effects of patents from various sources found that patents by internal R&D boosted sales, profits, and corporate value (Lee *et al*., 2015). Also, the host country's property rights protection is an influencing factor on IT firm's international acquisition performance (Zhu & Qian, 2015).

Knowledge Intensive IT Human Capital

Another characteristic of IT firm that arose from our literature review is the knowledge intensive IT human capital. Human capital represents the combined knowledge, skill, innovativeness and capabilities of the firm's individual employees. Human capital is the critical asset in the knowledge era of IT firms (Kamath, 2008; Cooke & Huang, 2011). IT firms are composed of a mix of IT, methodology, and personnel to bring valuable solutions to customers by "high-knowledge people" (Cho, 2009a). People are key success factors in IT firms because the experience, motivation, and knowledge of employees define the quality of solutions (Cho, 2009a; Ramayah, 2010; Singh, 2010).

"IT firms rely on tacit knowledge-based resources such as employee talents, ideas and expertise rather than on physical assets…" C2-02 (Almeida, 2008)

"Decades ago, businesses generated value through tangible assets, such as building and equipment. In our more knowledge-based economy, businesses are likely to generate much of their value through differentiating themselves by using intangible assets. Human capital constitutes a key intangible asset." C2-01 (Abraham, 2015)

According to resource based view (Barney, 2001), firm resources include all assets, capabilities, organizational processes, firm attributes, information, knowledge, etc., controlled by a firm that enable the firm to conceive of and implement strategies that improve the firm's efficiency and effectiveness (Barney, 2001; Rugman & Verbeke, 2002). Besides tangible resources, intangible resources such as skill, competency and expertise are also important. It is widely accepted that intangible assets are the major drivers of corporate value and growth for IT firms (Kamath, 2008; Zhu & Qian, 2015; Dibiaggio *et al*., 2014). Bharadwaj (2000) adopted resource based view in the IS domain and considered human IT resources as one of the IS assets. IT human capital include people with both technical IT skills, such as programming, systems analysis and design, and people with managerial IT skills, such as the effective management of IS functions, and project management skills (Bharadwaj, 2000; Wade & Hulland, 2004).

In the existing literature, many have researched into how IT firms can attract employee talents. Early studies investigated the best human resource management practices for retaining IT experts and showed that satisfaction with a respectful and stimulating work environment; satisfaction with training and development; satisfaction with innovative benefits and satisfaction with incentive compensation significantly increase functional retention of employees in firms (Abraham, 2015). Others found 'employer brand' has become one of the most popular ways to manage highly qualified IT employees in the conditions of 'war for talent' (Kucherov & Zamulin, 2016).

Types of IT Firms

In this section, we discuss the three types of IT firms identified from the literature analysis, their characteristics and differences. Also, we will discuss the movements between different types of firms and recommendations on improvements in terms of innovation and improvisational capabilities. The 119 articles of IT firms are classified into two broad categories (See Appendix 1). The first category covers the majority of the journal articles analyzed. This includes articles such as "Innovation in IT firms: An investigation of intramural and extramural R&D activities and their impact" (Jha & Bose, 2015), where topics and/or problems of the research papers are about or closely related to IT firms. The first category of articles are very useful in identifying the recurring attributes and reveal the underlying characteristics of IT firms.

The second category includes articles where the topic of research is not about IT firms, but IT firms are used as their sample. For example, "Chinese Employees Negotiating Differing Conflict Management Expectations in a U.S.-Based Multinational Corporation Subsidiary in Southwest China" (Deng, 2014). The second category of articles also provided good sources of different types of IT firms as well as explicit and implied definitions of IT firms. Three broad types of IT firms emerged from the literature analysis based on the nature of the firm's main products or services (See Table 1).

Table 1: Types of IT Firm

Type I	Type II	Type III
IT hardware product producer	IT software and professional service provider	IT enabled service provider
Example: Dell, Nokia, Acer, Intel, Sony, Samsung and Taiwan Semiconductor	Example: Microsoft, CGI, Oracle, SAP and Symantec	Example: Uber, Airbnb, Amazon, Facebook and Twitter
C1 - 23 * C2 - 5 *	C1- 39 * C2 - 25 ****	C1 - 11 * C2 - 6 ****

C1 refers to the number of articles where the studies are about or closely related to IT firms.** C2 refers to the number of articles that are not about IT firms but used IT firm as their sample*

Type I IT Hardware Product Producer

The first type of IT firm that emerged from our analysis is the IT hardware product producer. Type I IT firms are mainly concerned with the production and/or manufacture of IT hardware products such as desktop and laptop PCs, tablet computers, servers, storage devices, smartphones, component of IT devices, etc. (Lee *et al*., 2015; Dibiaggio *et al*., 2014; Guo, 2014; Park & Lee, 2014).

"Some of these firms are computer manufacturers like IBM, Compaq and Hewlett- Packard . . ." C1-74 (Viardot, 2000)

"That Japanese hardware manufacturers will face increasing challenges due to the rising importance of embedded software in IT hardware products . . ." C1-04 (Arora *et al*., 2013)

Examples of Type I IT firms include Dell, Nokia, Sharp, Acer, Intel, Sony, Samsung Electronics and Taiwan Semiconductor (Lee *et al*., 2015; Findikoglu & Watson - Manheim, 2015). Although a number of researches recognize IT hardware product producer as a distinct type of IT firm (Viardot, 2000; Arora *et al*., 2013), very few research has actually investigated Type I IT firms. The existing studies on Type I IT firms are interested in technology assimilation and inventive performances. It was found from empirical research that effectiveness of technology assimilation is significantly higher when multidisciplinary and multifunctional teams are involved (Wong, 1998). In addition, organizational structure that encourages communication, networking and flexibility brought about by modern information technologies are shown to be important in achieving the right conditions for effective technology assimilation of Type I IT firms (Wong, 1998). Studies of Type I IT firms have also shown that complementarity and substitutability of knowledge elements are key determinants of the firm's inventive performance. The overall level of complementarity (substitutability) between knowledge components positively (negatively) contributes to firms' inventive performance. A relatively high level of substitutability (complementarity) positively (negatively) contributes to explorative inventions (Dibiaggio *et al*., 2014)

Type II IT Software and Professional Service Provider

The second type of IT firms that appeared from our data analysis is IT software and professional services providers. Type II IT firms provide their clients with a diverse range of IT services, ranging from simple support and maintenance projects to more complex custom software development (Feuerstein, 2013; Biancolino *et al.*, 2013). IT firms of this type tend to be both knowledge-based and labor intensive (Huber, 2013; Feuerstein, 2013). Examples of the Type II IT firms include Microsoft, CGI, Oracle, SAP and Symantec.

"Although the largest global providers remain Western companies such as IBM or Accenture, Indian service providers (e.g. Wipro, TCS and Infosys) have grown significantly and are able to compete in terms of cost. Accordingly, the 'global delivery model' of Indian service providers constitutes an exemplar for successful offshore outsourcing of IT services for many Western companies." C1-28 (Feuerstein, 2013).

"The IT consultants were employed as programmers, systems developers, systems architects and application architects. They worked on a consultant basis, charging customers per hour for providing them with IT-related services." C1-61 (Peterson, 2007).

"The market for IT services depends very much on outsourcing and the transfer of IT workers from the client to the IT firm. This has theoretical and empirical implications for how IT firms manage recruitment, skill development and job security." C2-09 (Grimshaw, 2009).

IT software and professional services providers can be further refined by the type of services they provide. However, it is common for large IT software and professional services firms to provide multiple if not all of the services. Types of IT software and professional services are shown below *(*Viardot, 2000; Findikoglu & Watson - Manheim, 2015; Kato, 2014) :

Software Development Services: These firms develop software products and solutions for businesses and consumers.

IT *Consulting Services*: They help client firms to adapt to changes in their operating environments with the use of IT. They involve business process design, marketing advice, change management, training and re-skilling.

Systems Engineering Services: They assist clients in the design and running of information systems and include capacity planning, systems management and help desk.

Systems Integration Services: These help client firms to make various information technologies work together to achieve business solutions and performance. Information technologies encompass very different elements like computer and communication hardware, operating and applications software, and multimedia technologies.

Support Services: These are designed to keep technological solutions running. They include hardware and software maintenance, repair, relocation and replacement. Back-up and business recovery services are also included allowing clients to carry on working even after a major disaster.

Outsourcing Services: They help client firms to concentrate on their core business. Outsourcing allows clients to hand over all or part of their information systems under long-term contracts.

Network Services: These enable the clients to enjoy the benefits of network computing and cover services like data network management, electronic transactions, workgroup applications, hosting and internet connections.

Unlike Type I firms, Type II firms have been studied extensively in the existing literature. Type II firms are most frequently used as sample IT firms as well. IT outsourcing has been a research focus on existing literature of Type II firms. (Simon, 2011; Feakins, 2009; Miozzo, 2008; Grimshaw & Miozzo, 2006). Study has shown that the decisions of client companies to outsource is strongly influenced by both internal (i.e., asset-specificity, size, and internal organization of IT) and external (i.e., institutional environment) determinants (Barthélemy, 2005). Also, IT services firms move between countries not only in their own operations, but also the execution of contracts with client firms. These practices relocate client firms' outsourcing from subsidiaries of IT firms within the same national economy to subsidiaries located outside it, in turn facilitating consolidation and regionalization of business segments of multinational client firms (Miozzo, 2008).

Another area of focus in the literature is the internationalization of Type II IT firms (Paul & Gupta, 2014; Feuerstein, 2013; Yang & Hsia, 2007). In traditional models such as product life cycle theory, firm internationalization is seen as a gradual process of capability build-up by which firms slowly accumulate the resources necessary to face foreign market uncertainty (Paul & Gupta, 2014). However, this is not the case for IT firms, empirical results indicate that IT firm age has no impact on internationalization. IT firms are "born-global" firms that, apparently, had undergone faster processes of internationalization than would have been expected for firms of similar size, age, and nature (Paul & Gupta, 2014; Yang & Hsia, 2007)

Other studies have investigated the human resources management of Type II IT firms (Goles *et al*., 2008; Mathiassen, 2008; Zampieri, 2004; Blomquist, 2007). As technology advances and the business environment continues to change, a key challenge facing IT software and service providers is identifying critical skill sets, both today and in the future. Studies have indicated software and services providers place increasingly more emphasis on business domain and project management skills than on technical skills (Goles et al., 2008).

Type III IT Enabled Service Provider

The third type of IT firms that surfaced from our analysis is IT enabled service providers. Type III IT firms differs from Type II IT firms in the fact that the service provided by the third type are not IT professional services, but other services in a variety of industry. Examples include taxi services in the case of Uber, accommodation services in the case of Airbnb and social media services such as Facebook and Twitter. However, IT still forms the core competencies of this type of firms. The services Type III IT firms offer are IT enabled services in which without the key resources of IT infrastructure, personnel and knowledge, these types of firms would not exist.

"Twitter, along with Facebook and Youtube, represents the rapid growth of Web 2.0 ... has been the fastest growing social media platform ... " C1- 80 (Zhu & Qian, 2015).

"Alibaba International and Alibaba China were established in 1998 in Hong Kong and in Hangzhou ... It now has 300,000 visits daily. Alibaba China is a Chinese site for domestic trade . . ." C1-21 (Chung *et al*., 2013).

Type III IT firms arise from the digital economy. Digital networking and communications infrastructure provide a global platform where people and organizations can cooperate, communicate, search for and obtain information as much as exchange digital products and services (Grzunov, 2014). Many recent start-up IT firms fall into this type. Organizations with innovative ideas of better or even completely new ways of doing business, offering services and sales of tangible and intangible assets find their place in the sector of internet entrepreneurs (Chung *et al*., 2013).

"This rather new system mostly relies on information technology (P2P) to empower individuals and other profit and non-profit organizations with ways of sharing excess capacity in goods, knowledge and services. ... Airbnb.com, as an outstanding example of the new e-business model, enables individuals to rent their unoccupied living space and other short-term accommodation to guests . . ." C1-36 (Grzunov, 2014)

Type III IT firms has been largely ignored in the existing literature. Some scholars have recently started to pay more attention in Type III firms (Tiago *et al*., 2016; Chae, 2015; Andriole, 2010; Cusumano, 2012). A few articles investigated Type III firms such as Facebook and Twitter (Cusumano, 2012; Tiago *et al*., 2016; Chae, 2015). The role of Twitter in supply chain management has been investigated, and it was found that supply chain tweets are used by different groups of supply chain professionals and organizations (e.g., news services, IT companies, logistic providers, manufacturers) for information sharing,

hiring professionals, and communicating with stakeholders (Chae, 2015). Also, Facebook IPO has been studied and factors that reflect a company's worth have been explored (Cusumano, 2012).

Innovation and Improvisational Capabilities of Different Types of IT Firms

Even though all IT firms have a strong focus on innovation, different type of IT firms focuses on different types of innovation. An innovation can be a new product or service, a new production process technology, a new structure or administrative system, or a new plan or program pertaining to organizational members (Damanpour, 1991). For many years, researchers have established the importance of demarcating between the types of innovation to better understand innovation strategies as well as determinants of each innovation category (Downs Jr. & Mohr, 1976; Damanpour, 1991).

Innovation types can be categorized in several ways. Early studies of innovation types had a binary focus in pairs such as product/process, administrative/technical and radical/incremental (Rowley *et al*., 2011). In recognition of the increasing significance for firms managing across the range of different types of innovation, a number of integrative models of innovation have been proposed (Damanpour, 1991; Trott, 2008; Rowley *et al*., 2011). A commonly used typology proposed by Trott (2008) classified innovations into four types: product, process, marketing and organizational innovation.

Product innovation is the implementation of a new or significantly improved product (good or a service). Product innovation aims to present a new or improved product or service for the customers and customers see the impact of such innovation in the products or services they receive. Process innovation refers to the implementation of a new or significantly advanced method, often aimed at improving efficiency or service delivery. Process innovations involve new elements introduced into an organization's production or service operations-input materials, task specifications, work and information flow mechanisms, and equipment used to produce a product or render a service. Product and process innovations are considered to be technical innovations and are related to basic work activities (Damanpour, 1991; Trott, 2008).

Marketing innovation constitutes the introduction of new commercial methods in product design, product access, product promotion or pricing strategies for new and existing services. Organizational innovation is concerned with new organizational methods in the firm's business practices and workplace organization. For example, new mechanisms to improve learning and knowledge sharing among staff, the integration or disintegration of departments, the introduction of quality management systems, as well as new education and training schemes would be considered as organizational innovations. Marketing and organizational innovations are considered to be administrative innovation which involves changes to the social structures of the firm. Marketing and organizational innovations are more directly related to the firm's management and are indirectly related to the basic work activities (Trott, 2008; Damanpour, 1991). In this paper we separate the types of innovation in IT innovation and business model innovation. We define "IT innovation" to be product and process innovations that are technical and IT related. We define "business model innovation" to be marketing and organizational innovations that are management focused, such as a new way of doing business (See figure 2).

Apart from innovation, another key characteristic of IT firms identified earlier was that IT firms operate in a highly turbulent business environment where an unpredictable, rapidly changing environment is the norm (Ramayah, 2010; Cisco & LIW, 2015). Competitive advantage in the turbulent environments can be based on undertaking reconfiguration better, faster, and more efficiently than the competition (Ilinitch *et al*., 1996). As a result, the firm's improvisational capabilities play an important role in such business environments. We define improvisational capability as the ability to spontaneously reconfigure existing resources to build new operational capabilities to address urgent, unpredictable, and novel environmental situations (Pavlou & El Sawy, 2010).

The three types of IT firms appear to be different in the type of innovation they focus on initially and their level of improvisational capability. Type I IT firms tend to be high in IT innovation but low in business model innovation. Given the shorter product cycle and more dynamic industrial environment, IT hardware product manufactures have to constantly innovate to keep their product up to date ((Banker *et al*., 2011; Almeida, 2008). It is not surprising that the Type I IT firms would be highly focused on technical innovation (Almeida, 2008; Dibiaggio *et al*., 2014; Banker *et al*., 2011). On the other hand, the product manufacturing business model is very mature and therefore little focus is given to business model innovation such as a new organizational method of business practice or a new way of doing business (Dibiaggio *et al*., 2014; Ramayah, 2010). Also, Type I IT firms tend to have lower improvisational capabilities compared to Type II and Type III firms. Higher proportion of assets are invested in longer term fixed assets such as factory and machinery, and as a result it is harder for Type I firms to reconfigure existing resources in a sudden change of business environment (Arora *et al*., 2013; Nidumolu *et al*., 2009).

Type II IT firms are considered to be intermediate in both IT innovation and business model innovation. These type of firms provide their clients with a diverse range of IT services, ranging from simple support and maintenance projects to more complex custom software development (Feuerstein, 2013; Biancolino *et al*., 2013). Technical IT innovation is an important part of the business in order to achieve competitive advantage (Swinarski *et al*., 2012; Biancolino *et al*., 2013; Wang *et al*., 2012; James *et al*., 2013). However, being service orientated firms, Type II firms also put in considerable effort in business model innovation such as finding new ways to improve knowledge sharing among employees in the company. (Park & Lee, 2014; James *et al*., 2013; Pandey & Dutta, 2013). Type II firms have better improvisational capabilities than Type I firms,

because greater portion of their assets are in the form of human capital. It is easier for Type II firms to reconfigure their resources to respond to the market changes (Grimshaw, 2009; Singh, 2010).

Table 2: Innovation Level and Improvisational Capability of IT Firms

Type of IT Firms	Level of IT Innovation	Level of Business Model Innovation	Improvisational Capability
Type I	High	Low	Low
Type II	Medium	Medium	Medium
Type III	Medium	High	High

Type III firms are more celebrated for their business model innovation. Type III firms differs from Type II firms in terms of the degree of business model innovation. Type II firms tend to have incremental improvement in their business model, whereas Type III firms are revolutionary in their business model innovation such as introducing new way of doing business altogether. (Tiago *et al*., 2016; Cusumano, 2012; Zhao, 2008). Type III firms such as Twitter, and Facebook tend to use existing IT technology where the level of IT innovation is medium (Andriole, 2010). Type III IT firms can be considered as focusing more on business model innovation initially to gain market share. However, Type III firms usually have higher improvisational capabilities compared to with the other 2 types. Due to the flexible structure of Type III firms, they are better at reconfiguring existing resources to address new market challenges and capture new market opportunities (Ribeiro Soriano *et al*., 2012; Zervas *et al*., 2014).

The Changing Types and Development of IT Firms

With rapidly changing business environments due to the ***movements*** toward globalization and the emergence of new advanced technologies at a very fast pace, many IT firms find themselves in need of increased flexibility and adaptability to change and to reinvent themselves. Therefore, it is no surprise that some IT firms have overlapping product/services or change from one type to another in order to stay competitive (Cisco & LIW, 2015; Arora *et al*., 2013; Almeida, 2008)

"It is presently undergoing a radical transformation that is somewhat unprecedented in the corporate world. After carving out such an enviable reputation as a hardware provider, Cisco decided to meet emerging marketplace changes by evolving into a software and services firm ... " C1-25 (Cisco & LIW, 2015)

In light of the adaptation from one type of firms to another in order to survive, we propose the following IT firm development framework that outlines the direction of improvement for the three types of IT firms emerged in the literature (See figure 2 below).

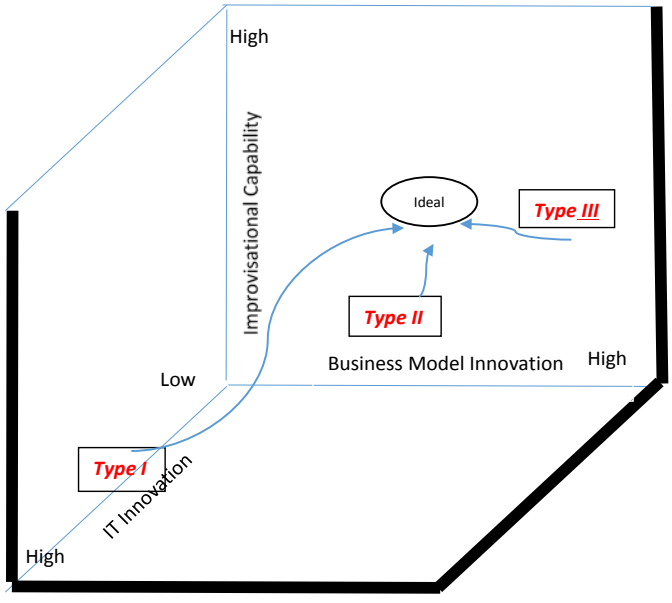

Figure 2: IT Firms Development Framework

Ideally, in order to gain maximum competitive advantage in the turbulent external environment, IT firms should be strong in all three dimensions. Therefore, an IT firm should aim to have high level of IT innovation, high level of business model innovation, as well as high level of improvisational capabilities. Type I firms need to find ways to be more flexible and increase their improvisational capabilities and experiment with business model innovation. Type II firms also have room for improvement in all directions. Type III firms can look into improvement in IT innovation in order to develop core technologies that is not easily imitated by competitors with similar business models.

Also, as mentioned previously, the types of IT firms are not strictly clear cut and can sometimes overlap. It is not uncommon to have firms changing form one type to another or become a hybrid firm encompassing more than one type to stay competitive. For example, traditional Type III firm such as Amazon is also focusing on IT hardware innovation and develop product such as Kindle (Striphas, 2010).

New Definition

We gathered existing IT firm definitions through the thorough literature review of the 119 selected journal articles. The text of each article was examined and definitions extracted. Some articles referred to definitions of IT firms elsewhere rather than offering their own definition. Ultimately 10 definitions were collected from the literature (See appendix 2). Some existing definitions simply defines a firm to be an IT firm if they operate in the IT industry (Zhu & Qian, 2015; Canace, 2014; Sueyoshi, 2013; Arora *et al*., 2013), while many other articles used the term "IT firm" without providing a definition.

Table 3: Existing Definitions and Limitations

Authors	**Definitions**	**Limitations**
(Lee *et al*., 2015, Pollach, 2011)	Companies that have been listed as IT companies on the 'Forbes Global 2000'	Based on vague, undefined constructs
(Zhu & Qian, 2015, Hwang *et al*., 2013)	Companies in the following industry: communication transmission lines, electronic computers, audio and video equipment, communications equipment, electronic components, electrical equipment, telecommunications, computers and computer peripheral equipment and software, computer and computer software service, computer programming services, telecommunications equipment repair, and computer repair training	Based on an single perspective (industry the firm is operated in), associated also with firm that are not IT firm and might exclude other IT firms that do not belong to the listed industries
(Ovidiu-Iliuta, 2014)	Companies identified by the Chamber of Commerce which are competing in IT market.	Based on vague, undefined constructs
(Sungsin, 2014, Yen & Lin, 2011, Huang, 2009, Paul & Gupta, 2014, Kemme *et al*., 2014)	Firms listed on the stock market/stock exchange as IT Firms	Based on vague, undefined constructs
(Canace, 2014, Sang-Yong Tom, 2006)	We classify firms in the following industries as IT firms: computers and office equipment; communications equipment; electronic components and accessories; scientific and engineering instruments including laboratory apparatus, analytical, optical, measuring and controlling instruments; photographic equipment; computer programming, data processing and other computer related including software.	Based on an single perspective (industry the firm is operated in), associated also with firm that are not IT firm and might exclude other IT firms that do not belong to the listed industries
(Sueyoshi, 2013)	Firm in the IT industry, which includes computer, telecommunications and electrical machinery and apparatuses firms.	Based on an single perspective (industry the firm is operated in), associated also with firm that are not IT firm and might exclude other IT firms that do not belong to the listed industries
(Molla, 2013)	Members of the Australian Information Industry Association (AIIA). The AIIA is a national organization representing Australia's information technology and telecommunications industry.	Based on vague, undefined constructs
(Arora *et al*., 2013)	Standard & Poor's Global Industry Classification Standard (GICS) classification so that only firms appearing in ''electronics,'' ''semiconductors,'' ''IT hardware,'' and ''IT software and services'' categories are considered IT Firm	Based on an single perspective (industry the firm is operated in), associated also with firm that are not IT firm and might exclude other IT firms that do not belong to the listed industries
(Ramayah, 2010)	This study focuses on ICT firms in the software sector in Malaysia. The ICT industry in Malaysia consists of three major sub-sectors, namely: 1. computer and computer peripherals and data storage devices; 2. telecommunications equipment/devices; and 3. the software development sector (Malaysian Industrial Development Authority, 2004).	Based on an single perspective (industry the firm is operated in), associated also with firm that are not IT firm and might exclude other IT firms that do not belong to the listed industries

(Silvola, 2006)	We define high-tech firms by their R&D intensity. In addition, we define software industry as a special type of R&D-intensive firm	non-exclusive, based on a single perspective of IT firm (R & D activities)

We found the existing definitions to be limiting in nature and can create problems in defining IT firms. Most of the definitions are based on a single perspective (industry the firm is operated in), and can be associated also with firms that are not IT firm and exclude other IT firms that do not belong to the listed industries. Other definitions are based on vague undefined constructs. Given the limitations of the existing definitions, we found none of the existing definition being a comprehensive definition that completely captured the essence of IT firms, even though the existing literature provide fragmented aspects of IT firms. A new comprehensive and integrated definition of IT firms was developed from the in-depth analysis of the text of the relevant chosen IT articles.

According to the above analysis, we propose a comprehensive and integrated new definition of IT firm:

An IT firm is a firm where the production and/or the use of information technology form (s) the core competency of the firm, and IT human capital is a major strategic resource of the firm.

Information technology is defined by the US Bureau of Economic Analysis (BEA) as office, computing and accounting machinery (OCAM) which consists primarily of computers. Information processing equipment (IPE) is also considered part of IT. IPE includes communication equipment, scientific and engineering instruments, photocopiers and related equipment. In addition, software and related services are included (Brynjolfsson & Yang, 1996). In short, IT refers to technology, and essentially hardware, software and telecommunication networks. It is thus both tangible (e.g., servers, personal computers, routers and network cables) and intangible (e.g., software of all types). IT facilitates the acquisition, processing, storage, delivery and sharing of information and other digital content (Brynjolfsson & Yang, 1996). Core competency can include tangible assets as well as intangible skills and know-how possessed by an organization. Core competencies are defined as "areas where an organization must excel in order to maintain leadership" (Drucker & Drucker, 1994).

Our definition has advantage over existing definitions in several ways. Firstly, existing definitions using a firm's industry membership are limiting and can be associated also with firms that are not IT firms and exclude other IT firms that do not belong to the listed industries. Our definition overcomes the industry limitations since IT firms in any industry can be included. Secondly, our definition is based on literature with clearly defined constructs compared to other definitions that are based on vaguely undefined constructs such as stock exchange listings. Thirdly, existing definitions tend to be fragmented and only describe a single perspective of IT firms, whereas our definition is comprehensive and integrated, capturing the full essence of IT firms. The conceptual framework and textual definitions, which seek to subsume and supersede earlier definitions, recognize that a comprehensive and integrated definition of IT firm needs to encompass a number of dimensions of the essence of an IT firm.

CONCLUSIONS

IT firms have grown in economic importance in the last few decades (Canace, 2014). It is the interest of both practitioners and researchers across a range of business management and information system disciplines. Having conducted a systemic literature review, we proposed a new conceptual definition and conceptual frameworks which together summarizes the essence of "IT firms".

This study is of both theoretical and practical importance. We have provided a deep understanding of IT firms. The definition we proposed of IT firm offers a way forward for identification of IT firms with increased understanding and a clear boundary. The conceptual framework synthesized the characteristic dimensions of IT firms. It not only improves current understanding of IT firms but also provides a solid foundation for further studies of IT firms. The types of IT firms developed in this paper offers a means of classifying different IT firms. The IT firm development framework in relation to innovation focus and improvisational capabilities not only advances understanding about IT firms, but also provide further research opportunities towards empirical testing and knowledge building. The insights discovered in this paper is also useful for business practitioners in strategy and consulting. The frameworks provide useful knowledge and advice for IT firms within the industry.

However, there are limitations with this paper. As a conceptual paper, we have developed the textual definitions and conceptual frameworks from existing theoretical work in a range of disciplines. Further empirical work is needed to validate the proposed definition and framework in terms of its suitability, usefulness and acceptability across different disciplines. Although this research has provided some clarification of IT firms, there are many areas for future-related research. The IT firm innovation process deserves deeper understanding. The relationship between the different characteristics of IT firms also need further investigation.

REFERENCES

[1] Abraham, S. (2015). What are the best HRM practices for retaining experts? A longitudinal study in the Canadian information technology sector. *International Journal of Manpower*, 36 (3), 416-432.

[2] Ackroyd, S. (1995). On the structure and dynamics of some small, UKbased information technology firms . *Journal of Management Studies*, 32 (2), 141-161.
[3] Al-Debei, M. & Avison, D. (2010). Developing a unified framework of the business model concept. *European Journal of Information Systems*, 19 (3), 359-376.
[4] Almeida, S. (2008). Survival strategies and characteristics of start-ups: An empirical study from the New Zealand IT industry. *Technovation*, 28 (3), 161-169.
[5] Altheide, D. L. (1996). *Qualitative Media Analysis*. Thousand Oaks, CA: Sage Publications.
[6] Andriole, S. J. (2010). Business Impact of Web 2.0 Technologies. *Communications of the ACM*, 53 (12), 67-79.
[7] Arora, A., Branstetter, L. G., & Drev, M. (2013). Going soft: How the rise of software-based innovation led to the decline of Japan's IT industry and the resurgence of Silicon Valley. *Review of Economics and Statistics*, 95 (3), 757-775.
[8] Banker, R. D., Wattal, S., & Plehn-Dujowich, J. M. (2011). R&D versus acquisitions: Role of diversification in the choice of innovation strategy by information technology firms. *Journal of Management Information Systems*, 28 (2), 109-144.
[9] Baregheh, A., Rowley, J., & Sambrook, S. (2009). Towards a multidisciplinary definition of innovation. *Management Decision*, 47 (8), 1323-1339.
[10] Barney, J. B. (2001). Resource-based theories of competitive advantage: A ten-year retrospective on the resource-based view. *Journal of management*, 27 (6), 643-650.
[11] Barthélemy, J. (2005). An empirical investigation of IT outsourcing versus quasi-outsourcing in France and Germany. *Information & Management*, 42 (4), 533-542.
[12] Bharadwaj, A. S. (2000). A resource-based perspective on information technology capability and firm performance: an empirical investigation. *MIS Quarterly*, 24 (1), 169-196.
[13] Biancolino, C. A., Maccari, E. A., & Pereira, M. F. (2013). Innovation as a tool for generating value in the IT services sector. *Revista Brasileira de Gestão de Negócios*, 15 (48), 410.
[14] Blomquist, T. (2007). Project marketing in multi-project organizations: A comparison of IS/IT and engineering firms. *Industrial Marketing Management*, 36 (2), 206-218.
[15] Breznik, L. & Lahovnik, M. (2012). Innovation capability as a source of competitive advantage in Slovenian information technology firms,. *Technics Technologies Educaton Managment*, 7 (3), 1132-1144.
[16] Bryman, A. (2015) *Social Research Methods*: Oxford University Press.
[17] Brynjolfsson, E., & Yang, S. (1996). Information technology and productivity: A review of the literature. *Advances in Computers*, *43*, 179-214.
[18] Canace, T. M., Steven. (2014). The impact of technology-motivated M&A and joint ventures on the value of IT and non-IT firms: a new examination. *Review of Quantitative Finance & Accounting*, 43 (2), 333-366.
[19] Chae, B. (2015). Insights from hashtag upplychain and twitter analytics: Considering twitter and twitter data for supply chain practice and research. *International Journal of Production Economics*, *165*, 247-259.
[20] Chen, S.H. (2004). Taiwanese IT firms' offshore R&D in China and the connection with the global innovation network. *Research Policy*, 33 (2), 337-349.
[21] Chen, Y.M. (2010). The continuing debate on firm performance: A multilevel approach to the IT sectors of Taiwan and South Korea. *Journal of Business Research*, 63 (5), 471-478.
[22] Cho, Y. (2009). Successful IT start-ups' HRD practices: Four cases in South Korea. *Journal of European Industrial Training*, 33 (2), 125-141.
[23] Cho, Y. M., & Gary N. (2009). Leading Asian countries' HRD practices in the IT industry: A comparative study of South Korea and India. *Human Resource Development International*, 12 (3), 313-331.
[24] Chung, S. A., Choi, Y., & Lim, J. S. (2013). The Role of the Entrepreneur and government in the development of Korean information technology firms. In P.O. de Pablos (Ed.). (2013). *International Business Strategy and Entrepreneurship: An Information Technology Perspective: An Information Technology Perspective* (Chapter 7, pp. 104-120). Hershey, PA: IGI Global.
[25] Cooke, F. L., & Huang, K. (2011). Postacquisition evolution of the appraisal and reward systems: A study of Chinese IT firms acquired by US firms. *Human Resource Management*, 50 (6), 839-858.
[26] Cumbie, B. A., Jourdan, Z., Peachey, T., Dugo, T. M., & Craighead, C. W. (2005). Enterprise resource planning research: where are we now and where should we go from here?. *JITTA: Journal of Information Technology Theory and Application*, 7 (2), 21-36.
[27] Cusumano, M. A. (2012). Technology strategy and management: Reflecting on the Facebook IPO. *Communications of the ACM*, 55 (10), 20-23.
[28] Damanpour, F. (1991). Organizational innovation: A meta-analysis of effects of determinants and moderators. *Academy of Management Journal*, 34 (3), 555-590.
[29] Deng, Y. & Xu, K. (2014). Chinese employees negotiating differing conflict management expectations in a U.S. based multinational corporation subsidiary in southwest China. *Management Communication Quarterly*, 28 (4), 609-624.
[30] Dibiaggio, L., Nasiriyar, M., & Nesta, L. (2014). Substitutability and complementarity of technological knowledge and the inventive performance of semiconductor companies. *Research Policy*, 43 (9), 1582-1593.
[31] Cisco & LIW (2015). Taking Cisco into a new era: The critical role of leadership development. *EFMD Global Focus*, 9 (3), 1-6.
[32] Downs Jr., G. W., & Mohr, L. B. (1976). Conceptual issues in the study of innovation. *Administrative Science Quarterly*, 21 (4), 700-714.
[33] Drucker, P. F. (1994). *Post-Capitalist Society.* Abingdon-on-Thames, UK: Routledge.

[34] Feakins, M. (2009). Offshoring in the core: Russian software firms onshoring in the USA. *Global Networks*, 9 (1), 1-19.
[35] Feuerstein, P. (2013). Patterns of work reorganization in the course of the IT industry's internationalization. *Competition & Change*, 17 (1), 24-40.
[36] Findikoglu, M. N. & Watson-Manheim, M. B. (2015). Do small and medium-sized IT firms form service partnerships with nonlocal IT firms? An assessment of facilitators. *Journal of Small Business Management*, 53 (4), 986-1010.
[37] Gemser, G., Jacobs, D., & Ten Cate, R. (2006). Design and competitive advantage in technology-driven sectors: The Role of usability and aesthetics in dutch it companies. *Technology Analysis & Strategic Management*, 18 (5), 561-580.
[38] Globerman, S., Shapiro, D., & Vining, A. (2005). Clusters and intercluster spillovers: Their influence on the growth and survival of Canadian information technology firms. *Industrial and Corporate Change*.
[39] Goles, T., Hawk, S., & Kaiser, K. M. (2008). Information technology workforce skills: The software and IT services provider perspective. *Information Systems Frontiers*, 10 (2), 179-194.
[40] Grimshaw, D. & Miozzo, M. (2006). Institutional effects on the IT outsourcing market: Analysing clients, suppliers and staff transfer in Germany and the UK. *Organization Studies*, 27 (9), 1229-1259.
[41] Grimshaw, D. M., Marcela. (2009). New human resource management practices in knowledge-intensive business services firms: The case of outsourcing with staff transfer. *Human Relations*, 62 (10), 1521-1550.
[42] Grinstein, A. & Goldman, A. (2006). Characterizing the technology firm: An exploratory study. *Research Policy*, 35 (1), 121-143.
[43] Grzunov, L. (2014). Evaluation of shared digital economy adoption: Case of Airbnb. In *The 37th International Convention on Information and Communication Technology, Electronics and Microelectronics (*pp. 1574-1579). IEEE-MIPRO, Opatija, Croatia, May 26-30.
[44] Guo, Y. G. (2014). Energy and network aware workload management for sustainable data centers with thermal storage. *IEEE Transactions on Parallel & Distributed Systems*, 25 (8), 2030-2042.
[45] Halpern, S. W. & Johnson, P. (2014). *Harmonising Copyright Law and Dealing with Dissonance: A Framework for Convergence of US And EU Law*. Cheltenham, UK: Edward Elgar Publishing.
[46] Holsti, O. R. (1969). *Content Analysis for the Social Sciences And Humanities*. Boston, MA: Addison-Wesley Pub. Co.
[47] Huang, Y. F. (2009). Strategic renewal within an information technology firm: Exploration, exploitation and corporate venturing. *International Journal of Entrepreneurial Behavior & Research*, 15 (5), 436-452.
[48] Huber, F. (2013). Knowledge-sourcing of R&D workers in different job positions: Contextualising external personal knowledge networks. *Research Policy*, 42 (1), 167-179.
[49] Hwang, J. H., Kim, M.S. & Chun, S.H. (2013). The role of R&D and corporate governance in Korea: IT firms versus non-IT firms. *Information Technology and Management*, 14 (1), 29-41.
[50] Ilinitch, A. Y., D'Aveni, R. A. & Lewin, A. Y. (1996). New organizational forms and strategies for managing in hypercompetitive environments. *Organization Science*, 7 (3), 211-220.
[51] James, T. L., Khansa, L., Cook, D. F., Bruyaka, O., & Keeling, K. B. (2013). Using network-based text analysis to analyze trends in Microsoft's security innovations. *Computers & Security*, 36), 49-67.
[52] Jha, A. K. & Bose, I. (2015). Innovation in IT firms: An investigation of intramural and extramural R&D activities and their impact. *Information & Management*.
[53] Kamath, B. (2008). Intellectual capital disclosure in India: Content analysis of "TecK" firms. *Journal of Human Resource Costing & Accounting*, 12 (3), 213-224.
[54] Kang, I., Han, S. & Shin, G.C. (2014). A process leading to strategic alliance outcome: The case of IT companies in China, Japan and Korea. *International Business Review*, 23 (6), 1127-1138.
[55] Kato, A. (2014). Software industry in okinawa: Is 'domestic offshore outsourcing' scheme feasible?. *Computer Systems Science and Engineering*, 29 (1), 115-126.
[56] Kemme, D. M., Nikolsko-Rzhevskyy, A. & Mukherjee, D. (2014). Foreign capital, spillovers and export performance in emerging economies: Evidence from Indian IT firms. *Review of Development Economics*, 18 (4), 681-692.
[57] Krippendorff, K. (2004). Reliability in content analysis. *Human Communication Research*, 30 (3), 411-433.
[58] Kucherov, D. & Zamulin, A. (2016). Employer branding practices for young talents in IT companies. *Human Resource Development International*, 19 (2), 178-188.
[59] Lee, B., Cho, H. H., & Shin, J. (2015). The relationship between inbound open innovation patents and financial performance: Evidence from global information technology companies. *Asian Journal of Technology Innovation*, 23 (3), 289-303.
[60] Locke, K. & Golden-Biddle, K. (1997). Constructing opportunities for contribution: Structuring intertextual coherence and "problematizing" in organizational studies. *Academy of Management Journal*, 40 (5), 1023-1062.
[61] Mathiassen, G. (2008). Between control and drift: Negotiating improvement in a small software firm. *Information Technology & People*, 21 (1), 69-90.
[62] Miozzo, M. (2008). Service multinationals and forward linkages with client firms: The case of IT outsourcing in Argentina and Brazil. *International Business Review*, 17 (1), 8-27.
[63] Molla, A. (2013). Identifying IT sustainability performance drivers: Instrument development and validation. *Information Systems Frontiers*, 15 (5), 705-723.
[64] Nidumolu, R., Prahalad, C. K. & Rangaswami, M. R. (2009). Why sustainability is now the key driver of innovation. *Harvard Business Review*, 87 (9), 56-64.
[65] Ovidiu-Iliuta, D. (2014). The link between organizatoinal culture and performance management practice: A case of IT companies form Romania. *Annals of the University of Oradea, Economic Science Series*, 23 (1), 1156-1163.

[66] Palvia, P. (2015). Methodological and topic trends in information systems research: A meta-analysis of IS journals. *Communications of the Association for Information Systems*, 37 (1), 30.
[67] Pandey, S. C. & Dutta, A. (2013). Role of knowledge infrastructure capabilities in knowledge management. *Journal of Knowledge Management*, 17 (3), 435-453.
[68] Park, J.G. & Lee, J. (2014). Knowledge sharing in information systems development projects: Explicating the role of dependence and trust. *International Journal of Project Management*, 32 (1), 153-165.
[69] Paul, J. & Gupta, P. (2014). Process and intensity of internationalization of IT firms–Evidence from India. *International Business Review*, 23 (3), 594-603.
[70] Pavlou, P. A. & El Sawy, O. A. (2010). The "third hand": IT-enabled competitive advantage in turbulence through improvisational capabilities. *Information Systems Research*, 21 (3), 443-471.
[71] Peterson, H. (2007). Gendered work ideals in Swedish IT firms: Valued and not valued workers. *Gender, Work & Organization*, 14 (4), 333-348.
[72] Pollach, I. (2011). Online privacy as a corporate social responsibility: An empirical study. *Business Ethics: A European Review*, 20 (1), 88-102.
[73] Porter, M. E. (1996). Competitive advantage, agglomeration economies, and regional policy. *International Regional Science Review*, 19 (1-2), 85-90.
[74] Ramayah, S. (2010). Product innovation among ICT technopreneurs in Malaysia. *Business Strategy Series*, 11 (6), 397-406.
[75] Ribeiro Soriano, D. (2012). Social networks and Web 3.0: Their impact on the management and marketing of organizations. *Management Decision*, 50 (10), 1880-1890.
[76] Rowley, J., Baregheh, A. & Sambrook, S. (2011). Towards an innovation-type mapping tool. *Management Decision*, 49 (1), 73-86.
[77] Rugman, A. M. & Verbeke, A. (2002). Edith Penrose's contribution to the resource-based view of strategic management. *Strategic Management Journal*, 23 (8), 769-780.
[78] Sang-Yong,Y.& Lim, L. (2006). The impact of M&A and joint ventures on the value of IT and non-IT firms. *Review of Quantitative Finance & Accounting*, 27 (2), 111-123.
[79] Silvola, H. (2006). Low-intensity R&D and capital budgeting decisions in IT firms. *Advances in Management Accounting*, 15), 21-49.
[80] Simon, R. (2011). An empirical investigation of client managers and responsibilities in managing offshore outsourcing of software-testing projects. *IEEE Transactions on Engineering Management*, 58 (4), 743-757.
[81] Singh, A. & Ebrahim, S. (2010). Knowledge management practices in Indian information technology companies. *Total Quality Management & Business Excellence*, 21 (2), 145-157.
[82] Striphas, T. (2010). The abuses of literacy: Amazon Kindle and the right to read. *Communication and Critical/Cultural Studies*, 7 (3), 297-317.
[83] Sueyoshi, T. (2013). A use of DEA–DA to measure importance of R&D expenditure in Japanese information technology industry. *Decision Support Systems and Electronic Commerce*, 54 (2), 941-952.
[84] Sungsin, K.& Seo, J.Y. (2014). A study on divident determinants for korea's information techonology firms. *Asian Academy of Management Journal of Accounting & Finance*, 10 (2), 1-12.
[85] Swinarski, M., Parente, D. H. & Kishore, R. (2012). Do small IT firms benefit from higher process capability?. *Communications of the ACM*, 55 (7), 129-134.
[86] Tak, J. & Lim, B. (2008). The differences in career-related variables between temporary and permanent employees in information technology companies in Korea. *Journal of Career Development*, 34 (4), 423-437.
[87] Tiago, T. (2016). Who is the better player? Off-field battle on Facebook and Twitter. *Business Horizons*, 59 (2), 175-183.
[88] Trott, P. (2008) *Innovation Management and New Product Development*. London, UK: Pearson Education.
[89] Viardot, E. (2000). Key features and importance of professional information technology-based services. *European Management Journal*, 18 (4), 454-461.
[90] Wade, M. & Hulland, J. (2004). Review: The resource-based view and information systems research: Review, extension, and suggestions for future research. *MIS Quarterly*, 28 (1), 107-142.
[91] Wang, Y.L., Huang, S., & Wu, Y.C. (2012). Information technology innovation in India: The top 100 IT firms. *Technological Forecasting and Social Change*, 79 (4), 700-708.
[92] Wong, V. S., Vivienne, S. & Peter J. H. (1998). Effective organization and management of technology assimilation: The case of Taiwanese information technology firms. *Industrial Marketing Management*, 27 (3), 213-227.
[93] Yang, Y.R. & Hsia, C.J. (2007). Spatial clustering and organizational dynamics of transborder production networks: A case study of Taiwanese information-technology companies in the Greater Suzhou Area, China. *Environment and Planning A*, 39 (6), 1346-1363.
[94] Yen, Y.Y. & Lin, M.Q. (2011). Host-country experience, location strategy and investment performance: An empirical study of Taiwan IT companies in China. *African Journal of Business Management*, 5 (24), 10067.
[95] Zampieri, S. (2004). Internal communication issues in an IT engineering department: A case study. *Corporate Communications: An International Journal*, 9 (1), 6-24.
[96] Zervas, G., Proserpio, D., & Byers, J. W. (2014). The rise of the sharing economy: Estimating the impact of Airbnb on the hotel industry. *Journal of Marketing Research*.
[97] Zhao, J. (2008). A study of B2B e-market in China: E-commerce process perspective. *Information & Management*, 45 (4), 242-248.

[98] Zhu, H. & Qian, G.M. (2015). High-tech firms' international acquisition performance: The influence of host country property rights protection. *International Business Review*, 24 (4), 556-566.

APPENDIX A

Type of Articles

Area of research	Number of articles	Category 1*	Category 2*
Information Systems	35	24	11
Accounting and Finance	4	3	1
Business and Management	50	35	15
Computer Science	6	5	1
Economics	10	7	3
Other	14	6	8
total	119	80	39

***Category 1 refers to articles where the studies are about or closely related to IT firms. Category 2 refers to studies that are not about IT firms but used IT firm as their sample.*